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ABSTRACT

Letter-letter, letter-number, and number-letter paired associates were used in this A-B, B-C, A-C study. There were two A-C lists, the positive-transfer stimulus-items of one became the negative-transfer stimulus-items of the other, and vice versa. Twenty subjects were included and each learned one A-C list. The main effects included, among subjects: sex (men, women), learners (quicker, slower), A-C lists (blue, red); within subjects: lists (A-B, B-C, A-C), transfer (positive, negative), and items (fastest, middle, slowest). In each analysis, quicker or slower learners tended to remain so; lists were not significantly different; corresponding items across lists did not remain fastest, middle, or slowest; transfer items were differentiated on A-C only. Other significances were discussed, but they were not consistent among analyses. The paper begins with a brief review related to inhibition and speed in paired-associate learning. (Author)

PAIRED-ASSOCIATE LEARNING BY INSTITUTIONALIZED ADULT RETARDATES: INHIBITION AND SPEED

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Brief Review

Duffy (1957) advanced the notion of "arousal" or "activation" in psychological learning or perception. Ellis (1963) developed a concept of stimulus trace and related it to adequate and inadequate learning. This concept has been specifically considered for the retarded. "Attention" has been emphasized by Zeaman and House (1963) in retardate learning. Its converse, distractibility, has also been noted (Matheny, 1968).

Overlearning and verbal transfer (Harcum, 1953) and repetition and retrieval (Melton, 1967) were investigated. Von Wright (1971) studied the effects of distributed practice on paired-associate recall.

Forward and backward associations have been evaluated (Harcum, 1953: Asch & Ebenholtz, 1962: Schild & Battig, 1966; Turnure & Walsh, 1971). Related to this directionality, Asch and Ebenholtz developed a notion of conceptual symmetry and a principle of associative symmetry.

Mordock (1968) in a review attempted to reconcile apparent differences with regard to retardate deficit or no-deficit paired-associate learning. He suggested simultaneous consideration of meaningfulness of stimulus, of similarity between stimulus and response, and of exposure times for stimulus and stimulus-response.

Briggs (1954) mentioned interference in learning a second paired-associate list because of the influence of the first. In other words, a first list has to be extinguished or unlearned as the second list is being learned. If retardates have an inhibition deficit (a difficulty in extinction or unlearning) the second list would require more trials to criterion. A basic consideration is inhibition: reactive, proactive, or

retroactive. Johnson and Sowles (1970) and Heal and Johnson (1970) reviewed in these areas.

Negative transfer has been analyzed by Spence and Schulz (1965) in terms of first-list trials. Greeno, James, and Da Polito (1971) stated that negative transfer and forgetting seem to include response competition, associative interference, and unlearning.

Positive transfer and remembering seem to include response facilitation, associative mediation, and learning. Peters (1935) and Bugelski and Scharlock (1952) experimentally produced verbal mediation. For a brief historical review of paired-associate learning, see Egnoski, Pedrini, and Pedrini (1973). The criterion to determine mediation (versus non-mediation) has usually been trials (correct and/or error) or time. For example, if there were significantly fewer trials to required criterion in mediation items, positive transfer allegedly took place. Speed or rapidity of learning, then, has been a critical variable.

But the speed of learning items on one paired-associate list may also relate to the learning of items on other lists. In other words, considerations between and among lists, not just within lists, may be important. Speed or rapidity of learning may be understood in this sense and has been researched by Schieble (1954), and Mandler and Huttenlocher (1956). Tulving and Madigan (1970), in their evaluative review of verbal learning and memory, include many articles on paired-associate learning.

This paper considers the effects of inhibition and speed on the learning of letter-letter, letter-number, and number-letter pairs. For a consideration of positive and negative transfer effects on paired-associative learning, see Egnoski, Pedrini, and Pedrini (1973). The Ss were institutionalized

adult retardates, 10 men and 10 women, controlled for intelligence and academic achievement.

Method

Subjects

The subjects were 20-34 years of age, had borderline intelligence on a verbal Wechsler Adult Intelligence Scale, read letters and numbers, and were institutionalized at the Glenwood (Iowa) State Hospital-School. The subjects were stratified for sex, and 10 men and 10 women were randomly chosen for participation.

There were no significant sex differences on the Wide Range Achievement Test for Reading ($\bar{x}$ = 4.4, SD = 1.3 versus $\bar{x}$ = 4.[illegible], SD = 2.3), and on the Wechsler Adult Intelligence Scale for verbal IQ ($\bar{x}$ = 76, SD = 3.0 versus $\bar{x}$ = 74, SD = 4.4). Nor were there sex differences on the Stanford Binet Intelligence Scale (Form L-M). However, the latter scale placed the subjects in the mildly-retarded rather than the borderline category of intelligence. This was expected (e.g., see Cochran & Pedrini, 1969). For a detailed presentation of materials and procedure see Egnoski, Pedrini, and Pedrini (1973).

Materials

The paired-associate lists included letter-letter, letter-number, or number-letter combinations. The model followed was A-B, B-C, A-C and each list included six pairs. There were experimental (positive-transfer) items, e.g., W W-N, N N-5, W W-5: and control (negative-transfer) items, e.g., R R-2, 2, 2 2-H, R R-6. The negative-transfer aspect occurred since the number "6" had also been used in list B-C with a different item association.

There were two A-C lists, designated "blue" or "red." The experimental (positive-transfer) stimulus-items of one list (three items) were used as the control (negative-transfer) stimulus-items of the other, and

vice versa. Each subject learned both experimental and control items on either a blue or a red A-C list.

The letters and numbers were printed in black on clear plastic slides and projected by a carrousel. Each subject worked in the same room and with the same equipment.

Procedure

The subjects were trained prior to the experiment per se on prototypal tasks (Egnoski, Pedrini, & Pedrini, 1973). One man-experimenter collected all the data. There were five-second projections of slides and five-second pauses between slides during a run through. The subjects responded verbally by the method of anticipation. The order of slide presentation was scrambled (i.e., mixed with non-systematized bias) after each list run-through, during a two-minute rest period. After each paired-associate was learned to a criterion of five correct trials (not necessarily consecutive), it was removed from the list. Eventually, each paired-associate was learned. There was a ten-minute rest period between lists.

Results and Discussion

The paired-associate data were analyzed (Winer, 1971, pp. 518-532) using a two-factor (2 X 3) analysis of variance (fixed factors: Sex; Lists) with repeated measures on one factor (Lists). Lists were I (A-B), II (B-C), and III (A-C, either blue or red). There were no significant main effects or interaction effects (data not shown). In other words, there appeared to be no differential effects for lists and/or sex in terms of inhibition or speed of learning. No one list seemed to produce greater or lesser inhibition of learning. or greater or lesser speed of learning.

Inhibition may include reaction, proaction, or retroaction. There were no learning differences on the overall lists with regard to reactive

inhibition. Nor were there differences for proactive inhibition (Briggs, 1954; Heal & Johnson, 1970; Johnson & Sowles, 1970). Retroactive inhibition was not formally considered, although the stimuli in the first and third lists were the same in our A-B, B-C, A-C model.

Of course other variables or problems may be operative, e.g., overlearning, directionality in lists, kinds of items, meaningfulness, interference, transfer, controls, training procedures, exposure periods, and times between items and lists. In terms of speed of learning (or its converse, inhibition?) what happens when items (rather than lists) are considered? Are there differential effects of items learned fastest, middle, slowest? of learners who were quicker or slower? Possible answers to these questions may be gleaned from other analyses.

Insert Table 1 about here

Table 1 includes a four-factor (2 X 2 X 3 X 3) partially-nested analysis of variance fixed-factor design. Learners (quicker of slower) were nested under Sex (men or women), and Lists and Items were repeated measures. Analysis I included Lists in the actual order given, i.e., I (A-B), II (B-C), and III (either blue or red A-C). Items (fastest, middle, or slowest) were subsumed under Lists, but in a special way. For Analysis I, the fastest Items were of list I but not necessarily of lists II or III. The corresponding items were carried across from I to II to III. The same basic procedures were followed for Analysis II (but with a II, III, I order). Actually, only the first set is critically first, the other two sets could be interchanged. The principle here is that the fastest, middle and slowest Items are in terms of the first set only.

In Table 1, Sex was a significant main effect in two of the three Analyses at the .05 level. However, the previous analysis of variance (2 X 3) did not show a significant sex difference. The women tended to be slower in terms of trials to criterion. Of course, in deference to women's liberation, one man-experimenter had collected the data.

The Lists were not significantly different (Table 1), nor were they in the 2 X 3 analysis. Items were significantly different in each of the Analyses, i.e., there were significant differences among the fastest, middle, and slowest. Remember that the designations "fastest," "middle," and slowest" are in terms of the first set (in each Analysis) only. The question then arises: Are the differences in Items seen on many lists or are they seen primarily on the first list (in each Analysis)? The significant Lists X Items interactions clarify this. In each Analysis, the first list caused the significant differences; there were no significant differences for the second and third lists with Items. But it is interesting to note that the pattern of fastest, middle, slowest was maintained in Analysis I, for each of its lists, not just the first. This was not true of the lists in Analysis II or III. And, Analysis I included the actual order of list presentation during the experiment.

The main effect of Learners (nested under Sex) was significant for all the Analyses (see Table 1). The learners were judged quicker or slower on the basis of the first list (subtotal score). The same persons were then carried across and, essentially, this is what was done for the Items discussed above. There were significant differences between quicker or slower Learners. But, are the differences seen on many lists or on the first list? In each Analysis, the quicker Learners were quicker for each list, and the slower Learners were slower for each list. So the more rapid or speedier Learners tended to remain so (ditto, for the slower Learners). And the greatest difference between

the Learner subgroups were not always found on the first list, though generally more apparent there. Of course, not all the differences were significant. The Lists X Learners interaction was significant at the .05 level in two of three Analyses. In Analysis II, differences between quicker Learners and slower Learners occurred on list I, greater differences generally occurred on list III, and greatest differences generally occurred on list II. In Analysis III, the greatest differences between quicker Learners and slower Learners eventuated on lists III and II, the least differences eventuated on list I.

Only one Items X Learners interaction (Table 1) was significant, and at the .05 level. In Analysis I, differences between quicker Learners and slower Learners were seen with fastest Items, greater differences with middle Items, and greatest differences with slowest Items. A similar pattern was noted in Analysis III, but the differences were not significant, not as marked. This pattern was not seen in the Analysis II data. Analysis I included the list order of the actual experiment.

Only in Analysis II, was the Lists X Items X Learners interaction significant, and at the .05 level. In this Analysis, neither the Lists nor Items X Learners were significant, but all the other terms represented in the interaction had achieved significance. There were differences between Learners for Items on list I, greater differences between Learners for Items on list III, and greatest differences between Learners for Items on List II. However, on list II, most of the differences between Learners were with the middle and slowest items; on list III, the differences between Learners tended to be equal; and on list I most of the differences between Learners were with the fastest Items. The patterns in the non-significant Analyses were different from each other and from the discussed (Analysis II).

In this experiment, each subject had learned positive-transfer and negative-transfer paired-associate items (3 of each) but on one list only, either red or blue. What of the possible differential effects of the blue or red forms of list III (the A-C of our paired-associate model A-B, B-C, A-C)? What of positive transfer and negative transfer which was built into list III, into the A-C lists? To consider some of these questions. a fixed five-factor (2 X 2 X 3 X 2 X 3) partially-nested analysis of variance design was developed and included in Table A . Two analyses were computed: in one, Learners (quicker, slower) were nested under Sex; and in the other, Learners were nested under List A-C (blue, red). Both analyses then included the repeated measures of Lists (III, II, I), Transfer (positive, negative) and Items (fastest, middle, slowest). The subclasses of Learners, Transfer, and Items were labeled on the basis of list III (scores or items) and then carried across (as was mentioned above). Essentially, then, the Sex Analysis (SA) of Table A was very similar to Analysis III of Table 1 (with the addition of transfer as main effect and in interaction effects, and with changes in the within-subjects error terms).

In Table A, or in Analysis III, Table 1, the main effects of Sex, $F\ (1,16) = 6.11$, $p < .05$, and of nested Learners, $F\ (2,16) = 15.09$, $p < .005$, were the same, for the among-subjects data were the same. List A-C was not a significant main effect. The Learners nested under List A-C showed a significant main effect, $F\ (2,16) = 11.66$, $p < .005$. And the Lists X Learners interactions reached significance, SA: $F\ (4,32) = 3.22$, $p < .05$; A-C: $F\ (4,32) = 3.33$, $p < .05$. The interpretations are the same as above (Table 1) the quicker or slower Learners tended to remain so on all lists.

Lists were not significant in Table A, nor were they in Table 1. Transfer was not significant either. Yet, Egnoski, Pedrini, and Pedrini

(1973) showed significant differences for the positive-transfer versus the negative-transfer items. They worked with list III (A-C) items only. In Table A, the Transfer items were carried across lists and were obviously diluted. In keeping with this the Lists X Transfer interactions were significant and just happened to come out exactly the same, $F(2,32) = 4.54$, $p < .05$. The Lists X Transfer mean-squares were the same, of course, but through happenstance the error terms also were the same. List III (A-C) caused the significant interactions. There were significant differences between the positive and negative Transfer scores on List III, but no significant differences on lists II and/or I.

The main effects of Items (Table A) were significant, SA: $F(2,32) = 9.38$, $p < .005$; A-C: $F(2,32) = 9.02$, $p < .005$; there were marked differences among the fastest, middle, and slowest. The Lists X Items interactions attained significance, SA: $F(4,64) = 12.34$, $p < .005$; A-C: $F(4,64) = 15.12$, $p < .005$. What lists were involved? The corresponding Items had been carried across from list III to II to I. The first list (as in the Table 1 Analyses) was primarily responsible for the significance.

The Items X Learners interaction achieved significance for SA: $F(4,32) = 3.00$, $p < .05$, but not for the A-C Analysis. The greatest differences between the quicker and slower Learners were with the slowest items. The fastest and middle Items did not seem differentiated for the Learners in Table A. This pattern is different from those reported for the Analyses in Table 1 (see above). The only consistency is that the slowest Items tended to differentiate most between the quicker and slower Learners (for all Analyses).

For the A-C Analysis, the Lists X Items X Learners interaction gained significance, $F(8,64) = 3.06$, $p < .01$. There were differences between Learners for Items on list I, greater differences between Learners for Items on List II, and greatest differences between Learners for Items

on List III. (This trend was not seen in any of the other Analyses from either Table.) Continuing with the A-C triple interaction, on lists III and I, the differences between Learners increased from fastest Items to middle Items to slowest Items; on list II, the differences between Learners were greatest for the fastest Items and least for the middle Items. This latter pattern was seen in the non-significant SA (Table A). Only two (of five) Lists X Items X Learners interactions (Analyses A-C and II) were significant and their patterns varied. This seemed dependent upon the first list classification of fastest, middle, and slowest. Remember, the first list Items were carried across. Had each list been independently classified for fastest, middle, and slowest Items, then the triple interaction patterns would have been more similar.

The effects of the Transfer X Items X List A-C interaction was significant, $F(2,32) = 3.75$, $p<.05$. Items were a significant main effect, but none of the other terms, as main or double-interaction effects, reached significance. List A-C included a blue list and a red list, wherein the experimental (positive-transfer) stimulus-items of one were the control (negative-transfer) stimulus-items of the other, and vice versa. There were differences, then, among Items (fastest, middle, slowest) for positive and negative transfer on the A-C blue and red lists. The differences among Items decreased from fastest to middle to slowest for positive transfer between blue and red lists. The differences among Items increased from fastest to middle to slowest for negative transfer between blue and red lists. The remaining interactions were not discussed, for they did not reach significance.

References

Asch, S. E., & Ebenholtz, M. The principle of associative symmetry. Proceedings of the American Philosophical Society, 1962, 106, 135-163.

Briggs, G. E. Acquisition, extinction, and recovery functions in retroactive inhibition. Journal of Experimental Psychology, 1954, 47, 285-293.

Bugelski, B. R., & Scharlock, D. R. An experimental demonstration of unconscious mediated association. Journal of Experimental Psychology, 1952, 44, 334-338.

Cochran, M. L., & Pedrini, D. T. The concurrent validity of the 1965 WRAT with adult retardates. American Journal of Mental Deficiency, 1969, 73, 654-656.

Duffy, E. The psychological significance of the concept of "arousal" or "activation." Psychological Review, 1957, 64, 265-275.

Egnoski, E. J., Pedrini, D. T., & Pedrini, B. C. Positive transfer and negative transfer effects on paired-associate learning by institutionalized adult retardates controlled for intelligence and achievement. Unpublished manuscript, University of Nebraska at Omaha, 1973.

Ellis, N.R. The stimulus trace and behavioral inadequacy. In N. R. Ellis (Ed.), Handbook in mental deficiency: Psychological theory and research. New York: McGraw-Hill, 1963. Pp. 134-158.

Greeno, J. G., James, C.T., & Da Polito, F. J. A cognitive interpretation of negative transfer and forgetting of paired associates. Journal of Verbal Learning and Verbal Behavior, 1971, 10, 331-345.

Harcum, E. R. Verbal transfer of overlearned forward and backward associations. American Journal of Psychology, 1953, 66, 622-625.

Heal, L.W., & Johnson, J.T. Jr. Inhibition deficits in retardate learning and attention. In N.R. Ellis (Ed.), International review of research in mental retardation. Vol. 4. New York: Academic Press, 1970.

Johnson, J. T., Jr., & Sowles, C. N. Proactive and retroactive inhibition as a function of intelligence. American Journal of Mental Deficiency, 1970, 75, 130-134.

Mandler, G., & Huttenlocher, J. The relationship between associative frequency, associative ability, and paired associate learning. American Journal of Psychology, 1956, 69, 424-428.

Matheny, A. J. Jr. Reactive inhibition as related to the mental retardate's distractibility. American Journal of Mental Deficiency, 1968, 73, 257-261.

Melton, A. W. Repetition and retrieval from memory. Science, 1967, 158, 532.

Mordock, J. B. Paired associate learning in mental retardation: A review. American Journal of Mental Deficiency, 1968, 72, 857-865.

Peters, H. N. Mediate association. Journal of Experimental Psychology, 1935 18, 20-48.

Schieble, H. Individual meaningfulness ratings and speed of learning with observations on retroactive and proactive inhibition. Unpublished doctoral dissertation, Northwestern University, 1954.

Schild, M. E., & Battig, W. F. Directionality in paired-associate learning. Journal of Verbal Learning and Verbal Behavior, 1966, 5, 42-49.

Spence, J. T., & Schulz, R. W. Negative transfer in paired-associate learning as a function of first-list trials. Journal of Verbal Learning and Verbal Behavior, 1965, 4, 397-400.

Tulving, E., & Madigan, S. A. Memory and verbal learning. Annual Review of Psychology, 1970, 21, 437-484.

Turnure, J. E., & Walsh, M. F. Extended verbal mediation in the learning and reversal of paired-associates by EMR children. American Journal of Mental Deficiency, 1971, 76, 60-67.

von Wright, J. M. Effects of distributed practice and distributed recall tests on later recall of paired associates. Journal of Verbal Learning and Verbal Behavior, 1971, 10, 311-315.

Winer, B. J. Statistical principles in experimental design. New York: McGraw-Hill, 1971.

Zeaman, D., & House, B. J. The role of attention in retardate discrimination learning. In N.R. Ellis (Ed.), Handbook in mental deficiency: Psychological theory and research. New York: McGraw-Hill, 1963. Pp. 159-223.

TABLE 1

Analyses of Variance concerning Sex (Men, Women) and Learners (Quicker, Slower) for Lists (I, II, III; or II, III, I; or III, I, II) and Items (Fastest, Middle, Slowest)

		Analysis I		Analysis II		Analysis III	
Source	df	MS	F	MS	F	MS	F
Among subjects	19						
Sex	1	73.47	3.32	73.47	6.47*	73.47	6.11*
Learners (nested w Sex)	2	100.45	4.53*	186.81	16.46***	181.43	15.08***
Error among	16	22.15		11.35		12.03	
Within subjects	160						
Lists	2	1.62		1.62		1.62	
Lists X Sex	2	4.82		4.82		4.82	
Lists X Learners	4	7.87		23.16	2.77*	25.84	3.92*
Error within lists	32	10.28		8.37		6.60	
Items	2	62.02	28.71***	32.62	8.45***	39.87	15.16***
Items X Sex	2	3.76	1.74	.82		1.74	
Items X Learners	4	6.67	3.09*	2.56		5.19	1.97
Error within items	32	2.16		3.86		2.63	
Lists X Items	4	16.46	4.28***	32.43	14.81***	46.23	11.62***
Lists X Items X Sex	4	2.45		1.15		1.01	
Lists X Items X Learners	8	6.08	1.58	5.36	2.45*	3.26	
Error within lists X items	64	3.85		2.19		3.98	

* $p < .05$

** $p < .01$

*** $p < .005$

TABLE A

Analysis of Variance concerning Sex (Men, Women) or List A-C (Blue, Red) and Learners (Quicker, Slower) for Lists (III, II, I), Transfer (Positive, Negative), and Items (Fastest, Middle, Slowest)

		Sex		List A-C	
Source	df	MS	F	MS	F
Among subjects	19				
A (Sex or List A-C)	1	36.75	6.11*	19.14	2.55
Learners (nested w A)	2	90.71	15.09***	87.57	11.66***
Error among	16	6.01		7.51	
Within subjects	340				
Lists (III, II, I)	2	.81		.81	
Lists X A	2	2.41		7.24	1.93
Lists X Learners	4	12.93	3.22*	12.53	3.33*
Error w lists	32	4.02		3.76	
Transfer (positive, negative)	1	6.14	3.63	6.14	3.99
Transfer X A	1	.01		2.34	1.52
Transfer X Learners	2	.73		.71	
Error w transfer	16	1.69		1.54	
Items (fastest, middle, slowest)	2	11.72	9.38***	11.72	9.02***
Items X A	2	.48		1.95	1.50
Items X Learners	4	3.75	3.00*	2.62	2.02
Error w iters	32	1.25		1.30	
Lists X Transfer	2	4.04	4.54*	4.04	4.54*
Lists X Transfer X A	2	.41		1.01	1.13
Lists X Transfer X Learners	4	1.07	1.20	.77	
Error w lists X transfer	32	.89		.89	
Lists X Items	4	18.75	12.34***	18.75	15.12***
Lists X Items X A	4	.58		1.02	
Lists X Items X Learners	8	1.78	1.17	3.80	3.06**
Error w lists X items	64	1.52		1.24	
Transfer X Items	2	.25		.25	
Transfer X Items X A	2	.89		4.42	3.75*
Transfer X Items X Learners	4	2.11	1.60	1.43	1.21
Error w transfer X items	32	1.32		1.18	
Lists X Transfer X Items	4	1.45	1.75	1.45	1.67
Lists X Transfer X Items X A	4	.25		1.11	1.28
Lists X Transfer X Items X Learners	8	1.55	1.87	.84	
Error w lists X transfer X items	64	.83		.87	

* $p < .05$
** $p < .01$
*** $p < .005$